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Instructional cues in the teaching of dribbling in school physical education classes

Leandro B. C. Pontes[ABCE], Go Tani[AD], Umberto C. Corrêa[D], Sergio R. Silveira[ABD]

Escola de Educação Física e Esporte, Universidade de São Paulo, São Paulo, Brazil

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Abstract

Background and Study Aim: A cue is a short and concise instruction about the key aspects of a successful performance. In addition to an attentional strategy, an instructional cue has been considered as a Physical Education teaching content for developing the students' knowledge about performing motor skills. This study investigated the effects of perceptual and motor instructional cues on the learning of dribbling during physical education classes at school.

Material and Methods: The sample comprised 81 students from three elementary full-time classes of a public school, aged between 6 to 9 years old. The study consisted of three experimental groups each one from a given PE classroom: (1) perceptual cue - "eye on the circuit"; (2) motor cue - "pushing the ball at waist level"; and control group – no cue.

Results: Results showed that motor cue group improved the performance in relation to all measures (stage of development, ball control, and runtime). In addition, they revealed that this group had superior performance comparatively to perceptual cue and control groups.

Conclusions: This study examined the effect of verbal motor cues on students' learning of dribbling in a Physical Education class. The results showed that the verbal motor cue functioned as a useful tool for providing students with information about the correct technique for dribbling. This information helped students to understand and execute the correct technique, resulting in improved dribbling performance. Overall, this study suggests that verbal motor cues can be a valuable teaching tool for Physical Education teachers when designing practice tasks. By selecting instructions that have the potential to improve students' knowledge about performance, teachers can help their students to acquire skills more effectively. These findings have important implications for the design of practice tasks in Physical Education classes and can help to optimize student learning outcomes.

Keywords: school education, teaching content, instruction, movement.

Introduction

What should be the focus of physical education (PE) in the school context has been focus of several propositions over the last few decades [1, 2, 3]. Notwithstanding the importance of them, it has been suggested that, at least, for PE to achieve its educational goals it needs to consider the complementarity of two types of learning: of and about motor skills [4].

The focus on motor skills as a subject in school contexts is based on their educational values, since they refer to those purposeful movements that characterize human cultural constructions (e.g., sports, plays, fights, and dances) and are practised in order to develop the human beings' wellness and quality of life [4, 5]. The learning of motor skills refers to the acquisition of ability to perform movements efficiently. In turn, the learning about movement concerns the acquisition of knowledge about the biological, psychological, and sociological dimensions and implications of motor skills [6, 7]. That is, if the first deals with learning to perform, the second deals with learning about what, how, when, how much and why to perform motor skills. Therefore, although the ability to use the body effectively and harmoniously (learning of movement) is sine qua non for life, the knowledge about its dimensions and implications (learning about movement) is fundamental, since the capacities and needs to perform motor skills change throughout life [8, 9].

Despite this, it has also been recognized that learning of motor skills requires time and amount of prolonged practice [10, 11]. For this reason, in many school contexts it has been difficult to promote this type of learning. For instance, in Brazilian schools the amount days and hours of PE classes by week are very small, while the number of students per class is very large. Furthermore, the space to practice motor skills and the availability of teaching materials and financial resources are also very scarce [12, 13]. For these reasons, recently Tani [6, 7] has proposed that school PE should emphasize the learning about motor skills. The main assumption here is that the knowledge about how to perform motor skills would allow students use it in further inside and outside school contexts opportunities of practice, including in relation to the other motor skills.

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In the last few years, the instructional cue has been considered as a PE teaching content potential candidate aimed at developing students' knowledge about performing motor skills [14, 15]. This is because a cue refers to a short and concise instruction on the key aspects of a successful performance [16, 17]. In other words, a cue comprises a knowledge about what is needed to get performance successful. For instance, the cue "eye on the ball" is suggested to direct the student's attention to the trajectory of a ball to be hit because it facilitates the information processing of anticipatory and coincident timing [18]. However, since the cue is expected to be closely related to the task specificity [19], student could also use it in countless situations that require the performer's attunement with a moving object in order to touch or hit it (e.g., football, volleyball, baseball, and cricket.

On this concern, a recent study by Silveira et al. [20] investigated the effects of different verbal cues on the learning of a fundamental motor skill of striking during PE classes. The sample of this study was made of 84 public school students aged between six to eight years old from three classrooms of the same school. Each classroom constituted a group: no cue, perceptual cue, and motor cue. The perceptual and motor groups were instructed that to maintain the eye on the ball and to hit with maximum speed would help them during their performances, respectively. Results showed the group that received perceptual cue promoted better learning of hitting a ball than the remain groups. It was concluded that the cue specific to the task may characterize itself as a knowledge based on which the students can improve their performances. The present study sought to advance the previous one by investigating the effects of perceptual and motor cues on the learning of a dribbling motor skill. If, on the one hand, the demand for successful performance of striking is perceptual due to the need to be in tune with the moving ball, on the other hand, in dribbling such demand would be diminished because it is the performer who drives the ball. Based on this, we asked: would a motor cue be an essential knowledge for performance of dribbling?

Materials and Methods

Participants

The sample included 81 students from three full-time elementary PE classes in a public school in the state of São Paulo - Brazil. They were males and females between 6 and 9 years old. The tutors conditioned the students' participation in the study to the signing of a consent form. All students participated voluntarily, and parental consent was obtained from the school board where the study was conducted, as approved by the local Institutional Review Board.

Research Design

Task and Materials

The learning task was the fundamental motor skill of dribbling. It refers to the action of repeatedly pushing the ball against the ground while running. The main requirement for successful performance of dribbling refers to the proper application of force on the ball during pushing and the maintenance of control over it after bouncing [21]. There were utilized five rubber balls (number 10), a Sony CyberShot camera (model DSC-V3) and three 50cm high rubber cones.

Procedures

The study consisted of three experimental groups from a given PE classroom: (1) perceptual cue (n = 27); (2) motor cue (n = 28); (3) control. The perceptual and motor cues were "eye on the circuit" and "pushing the ball at waist level," respectively. The control group did not received cue. Each student performed 36 trials of dribbling during five PE lessons, which were taught by the PE teacher. The study lasted one and a half week. They also performed three trials of a pre- and a post-test whose instruction was to perform the dribbles as quickly as possible along an 18m course (9m on the path and 9m behind), going around three cones separated by 3m in a straight line (Figure 1). Prior to the pre-test, students were allowed to bounce the ball in a stationary position for thirty seconds in order to become familiar with the task. The tests were filmed using a Sony CyberShot camera, model DSC-V3, positioned three meters from the starting position, towards the space to be covered with the dribbling skill. Virtual Dub software (v. 1.6), with 60 frames per second, was used as for the data recording.

Performances were analyzed considering the following aspects: (i) the developmental stage of dribbling, (ii) ball control, and (iii) running time. Regarding the first aspect, a checklist allowed identifying whether the students were in the early (looking at the ball; hitting the ball with loss of control over it, and the ball decreasing in height; slow movement due to lack of ball control), elementary (still looking at the ball; alternating control over it between pushing and hitting it; not maintaining a regular height of the ball; changing the speed of the ball's trajectory), or mature stage (being aware of the path; mastery of pushing the ball to the ground at waist level; dribbling with increasing speed) [21].

Regarding ball control, it referred to the number of losses of ball control over the course of the performance. This occurred when the student broke the continuity of pushing the ball against the ground. In this case, the dribbling should be restarted from the same location. Finally, running time referred to the time taken to complete the course in seconds. It

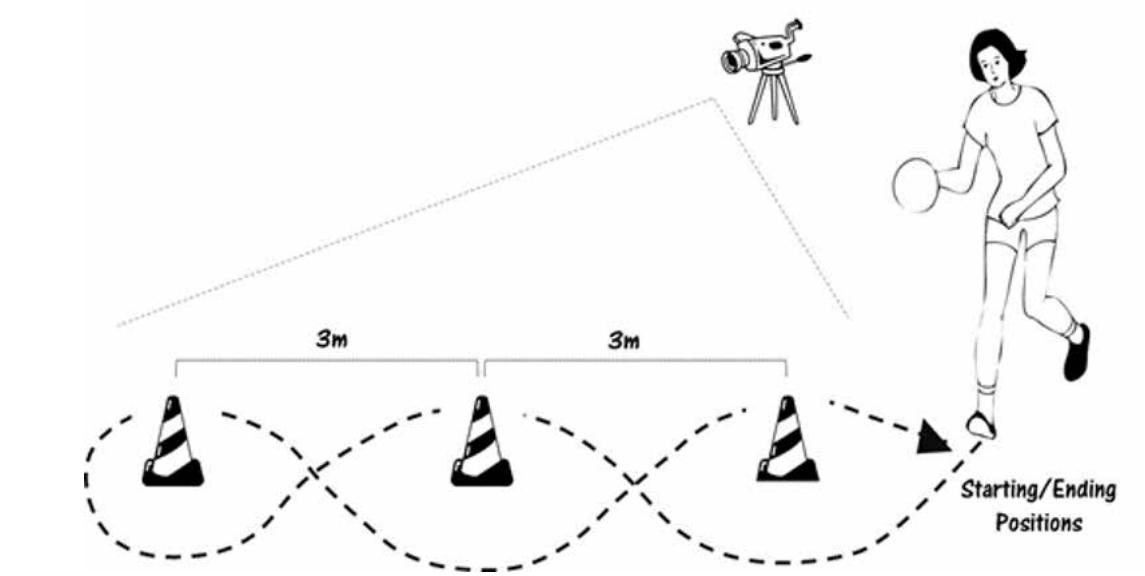

Figure 1. Illustration of the data collection environment.

was accessed by a digital stopwatch triggered at the moment of signalling the start and stopped when the student crossed the finish line. Median values from three trials were considered to analyze these measures.

In order to ensure the validity and reliability of the analyses, five raters were trained and two raters with a concordance index greater than 90% participated [22].

Statistical Analysis

Wilcoxon's test was run for pre- and post-test intragroup comparison, and Kruskall Wallis test was used for intergroups comparisons. All analyses considered the nature of the data and the results of Shapiro-Wilk's W and Bartlett's tests for normality and homogeneity of variance. The significance level adopted was $p < 0.05$ and the statistical package SPSS 19.0 was used.

Results

The distribution of students in the early, elementary, and mature stages of motor development, in the control, perceptual, and motor groups, and in the pre- and post-test are presented in Table 1. It shows that in the pre-test, students in all groups were mostly in the early stage. However, in the post-test, the number of students in this phase decreased as the number of students in the elementary stage increased. This was most evident in the perceptual and cue motor groups.

Table 2 shows the number of losses of ball control throughout the performance course, and the time taken to complete it, for the three groups (control, perceptual and motor cues), in the pre- and post-test. It can be seen that the control group had no change from pre-test to post-test. Differently, the other groups decreased the number of losses of ball control from pre- to post-test, with the motor cue group showing the lowest number of loss of ball control in the post-test. Regarding running time, Table 2 also shows that the motor cue group had the lowest time values and showed the greatest reduction in time spent to complete the course.

Table 3 presents the results of the Wilcoxon test. Results did not show learning effect for control and perceptual cues groups by considering the three measures analyzed. On the other hand, only the motor cue group shows a significant learning effect in all the measures analyzed.

Table 4 shows the results the Kruskall Wallis test. It revealed differences in the three measures and the results of multiple comparisons showed that motor cue group had superior performance than the other groups in relation to all performance measures.

Table 1. Distribution of students in the early (I), elementary (E), and mature (M) stages of motor development, in the control, perceptual, and motor groups, and in the pre- and post-test groups.

	Control		Perceptual		Motor	
Stage	**Pre-test**	**Post-Test**	**Pre-test**	**Post-Test**	**Pre-test**	**Post-Test**
I	25	23	23	18	22	8
E	1	3	4	9	5	17
M	0	0	0	0	0	3

Table 2. Median of the lost ball control number along the performance course and time spent to complete the course (sec), of the three groups (control, perceptual and motor cues), in the pre- and post-test.

	Ball Control		Runtime	
Group	**Pre-test**	**Post-Test**	**Pre-test**	**Post-Test**
Control	8	8	42	40
Perceptual	8	6	44	40
Motor	5	1	35	28

Table 3. Summary of Wilcoxon test for the three groups (control, perceptual and motor cues).

	Stage		Ball Control		Runtime	
Groups	**Value**	**P**	**Value**	**P**	**Value**	**P**
Control	364	0,15	296	0,21	307	0,28
Perceptual	432	0,06	288	0,09	322,5	0,23
Motor	597	0,0006	154,7	0,0004	252	0,01

Table 4. Summary of Groups comparison by the Kruskall Wallis test.

Measures	**Calculated value**	**p-value**
Development stage	21,9	0,00001
Ball control	27,55	0,00001
Runtime	28,85	0,0005

Discussion

The purpose of this study was to investigate the effects of perceptual and motor verbal cues on learning the fundamental motor skill of dribbling. Results showed superiority of the motor cue group to the perceptual and control cue groups with respect to all variables analyzed.

It is interesting to note that in the pre-test many students were in the early developmental stage, showing difficulty in performing the task quickly. This probably occurred due to the students' poor motor repertoire compared to what is expected for children in this age group [21, 23]. In addition, results also showed that the students of the motor cue group advanced to the elementary stage of development. This points out to the effects of motor learning on the motor development. Whereas the first concerns the changes in the ability to perform motor skills that are the result of specific practice [11], the second refers to changes in foregoing ability that occur throughout life (e.g. from childhood to adolescence, adulthood, and old age) [8].

The fact that perceptual cue did not influence the performance improvement gives support to the cue specificity hypotheses [14, 24]. Dribbling was practiced in this study as a closed motor skill that requires students' attention to control the movement. Thereat, the cue "push the ball at waist level" had more effect on performance than "eye on the circuit". Supporting evidence for the effects of specificity of cuing was also revealed by Gemas Neto et al. [25]. They investigated the effect of different instructional cue on the learning of a motor skill of aikido. Participants practiced the *choku tsuki* task (hit a target on the chest of an attacking opponent with a stick). The design comprised four groups: relaxation cue ("head up and loose joints"); low hip cue ("keep hips as low as possible"); perceptive cue ("strike target as soon as sword is raised"); and, control, which received no cue. Results showed that only the perceptive and low hip groups learned the motor skill. In addition, it revealed that the perceptive group obtained the best performance. According to the authors, this occurred because the perceptive cue made possible the learner's perceptive attunement to the displacement of the opponent and his sword.

Conclusions

The verbal motor cue functioned as information that constrained the students to the learning of dribbling. By considering that such information can allow students to understand and utilize what should be done to be successful in dribbling performance [14, 17, 20], it can be suggested as potential candidate of teaching content. In terms of practical application, at least, this study provides useful insight into the design of practice tasks in PE classes by suggesting that teachers should select the instruction according to its potential for development of knowledge about the performance [16]. In addition, they should consider the task specificity related to the success of the performance. Further studies should consider the learning stages. For example, if students are in the cognitive learning stage, should the cue be provided with information

about the general characteristics of the dribbling pattern? On the other hand, if students are in the associative phase, should the cue be provided with information about the interaction of the dribbling pattern's components? If we are assuming that the cue functions as a potential candidate for learning about motor skills, future research should include tests of declarative knowledge.

Conflict of interest

No potential conflict of interest was reported by the authors.

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Information about the authors:

Leandro B. C. Pontes; https://orcid.org/0000-0001-7248-0849; leobaroni@usp.br; Escola de Educação Física e Esporte, Universidade de São Paulo; São Paulo, Brazil.

Go Tani; https://orcid.org/0000-0002-6517-5472; gotani@usp.br; Escola de Educação Física e Esporte, Universidade de São Paulo; São Paulo, Brazil.

Umberto Cesar Corrêa; https://orcid.org/0000-0002-3465-0437; umbertoc@usp.br; Escola de Educação Física e Esporte, Universidade de São Paulo; São Paulo, Brazil.

Sergio Roberto Silveira; (Corresponding Author); https://orcid.org/0000-0001-9171-0777; ssilveira@usp.br; Escola de Educação Física e Esporte, Universidade de São Paulo; São Paulo, Brazil.

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